

Amendment to the Disclosure

[0005] Projection lithography is a powerful and essential tool for microelectronics processing and has supplanted proximity printing. "Long" or "soft" x-rays (a.k.a. Extreme UV) (wavelength range of 10 to 20 nm) are now at the forefront of research in efforts to achieve smaller transferred feature sizes. With projection photolithography, a reticle (or mask) is imaged through a reduction-projection (demagnifying) lens onto a wafer. Reticles for EUV projection lithography typically comprise a glass substrate coated with an EUV reflective material and an optical pattern fabricated from an EUV absorbing material covering portions of the reflective surface. In operation, EUV radiation from the illumination system (condenser) is projected toward the surface of the reticle and radiation is reflected from those areas of the reticle reflective surface which are exposed, i.e., not covered by the EUV absorbing material. The reflected radiation is [re-imagined] re-imaged to the wafer using a reflective optical system and the pattern from the reticle is effectively transcribed to the wafer.

Remarks:

The above Amendments and these Remarks are in reply to the Office Action mailed August 13, 2003. The fee for addition of new claims and conversion of claims from dependent form to independent form is included herewith.

Claims 1-28 were pending in the Application prior to the outstanding Office Action. In the Office Action, the Examiner rejected claims 1-8, 14-22 and 28, and objected to claims 9-13 and 23-27. The present Response amends claims 1, 2, 15, 16 and 24, cancels claim 14 and adds new claims 29-34, leaving for the Examiner's present consideration claims 1-13 and 15-34. Reconsideration of the rejections is requested.

Support for new claims 29-32 can be found in the pages 7 – 8 of the application. Support for new claims 33-34 can be found on page 9 of the application. Applicants request entry of the new claims.

The Examiner rejected Claims 1, 2, 5, and 14 under 35 U.S.C. 102(b) as being anticipated by Nakashima et al. (U.S. Patent No. 5,534,970). We respectfully disagree.

Nakashima teaches a projection exposure apparatus for transferring a pattern formed on a mask onto a photosensitive substrate by a scanning exposure method. The apparatus includes a light source for generating a light beam having a predetermined spatial coherence, an illumination optical system for receiving the light beam from the light source and illuminating a local area on the mask with the light beam, and a device for synchronously moving the mask and the photosensitive substrate so as to transfer the pattern on the mask onto the photosensitive substrate. A direction, corresponding to a higher spatial coherence of the light beam, is made to coincide with the direction of relative scanning an illumination area and the mask in the illumination area. (Nakashima, abstract. See also independent claims 1, 8, 11, 13, 15). In the patent, the terms mask and reticle refer to the same structure (Col. 1, lns 19 – 23.) Refer to Fig 7. The reticle R is moved in the direction SR in synchronization with the movement of the wafer W in direction SW, and vice versa. This synchronized movement is used to minimize exposure amount unevenness on a photosensitive substrate due to interference fringes.

Compare this to the device in the instant application, where there is no requirement that the reticle 70 or the wafer 64 be moved, in synchronization or not. The scanning mirror is the only component that is needs to move, and conventional beamline optics can be used to re-image

the beam from the scanning mirror to other planes. Non-uniform illumination problems are mitigated by overfilling the imaging mirror. Application paragraph [0032]. It is clear that the instant invention is not anticipated by Nakashima.

The Examiner also rejected claims 1, 2, 5, and 14 under 35 U.S.C. 102(b) as being anticipated by Murski et al (U.S. Patent No. 4,974,919).

Murski teaches an illumination device which includes a light source for supplying light, an optical system for forming plural light fluxes from the light supplied by the light source, a scanning system disposed to receive the light fluxes formed by the forming optical system and for scanning the light fluxes substantially at the same time, and another optical system effective to superimpose the scanned light fluxes upon one another on a surface to be irradiated.

As shown in FIG. 2, the illumination device of Murski includes a light source 11 such as an excimer laser which is arranged to produce a flux of coherent light. The device further includes a light dividing device 12 which is arranged to divide the coherent light emitted from the light source 11 into a plurality of light fluxes and also is arranged to emit the divided light fluxes in a state in which they are mutually incoherent. Refer to Figs 4A-4C. The light diving device uses prisms 31a and 31b to divide a coherent light flux and transform it into plural incoherent lights. The illumination device further includes a fly's eye lens system 13 which comprises plural lens elements, and a condenser lens 14 to direct each of the parallel light fluxes onto reflector 15.

Compare this with the instant invention, where the coherence of a single beam of coherent or partially coherent radiation is modified by means of a single moving reflective surface. There is no need to break the incident coherent beam into multiple incoherent beams prior to the beam hitting the moving reflective surface. This arrangement is different from the teachings of Mursh and is not anticipated by it.

Further, the Examiner rejected a number of claims under 35 U.S.C. 103(a). Claims 3, 4, 15-19 and 28 are rejected as being unpatentable over Nakashima in view of either de Mol et al (U.S. Patent No. 6,563,564) or the article entitled "Modification of the Coherence of Undulator Radiation." Claims 8 and 22 are rejected under 35 U.S.C 103(a) as being unpatentable over Nakashima et al in view of Felter et al (U.S. Patent No, 6,162,577) and claims 6, 7, 20, and 21 are rejected as being unpatentable over Nakashima in view of Hudyma (U.S. Patent No. 6,226,346).

As discussed above, the teachings of Nakashima require that the mask and the photosensitive substrate be moved in synchronous relation. A combination of Nakashima with the references as suggested by the Examiner would necessarily include this limitation. We submit that Nakashima, either taken separately or when combined with the cited references, do not teach nor render obvious applicants' invention. There is no requirement that the reticle or the wafer be moved in synchronization in applicant's invention.

The references cited by the Examiner but not relied upon have been reviewed, but are not believed to render the claims unpatentable, either singly or in combination.

Accordingly, applicants have amended and added new claims to further clarify their invention, and respectfully request reconsideration of the application and the claims.

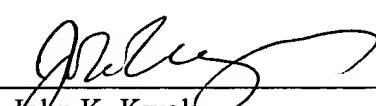
In light of the above, it is respectfully submitted that all of the claims now pending in the subject patent application should be allowable, and a Notice of Allowance is requested. The Examiner is respectfully requested to telephone the undersigned if he can assist in any way in expediting issuance of a patent.

The fee for addition of new claims (or conversion of claims from dependent form to independent form) is included herewith. An appropriate Petition for Extension of Time to Respond is submitted herewith, together with the appropriate fee.

The Commissioner is authorized to charge any underpayment or credit any overpayment to Deposit Account No. 06-1325 for any matter in connection with this response, including any fee for extension of time, which may be required.

Respectfully submitted,

Date: 12/4/2003

By: 
John K. Kwok
Reg. No.: 46,851

FLIESLER DUBB MEYER & LOVEJOY LLP
Four Embarcadero Center, Fourth Floor
San Francisco, California 94111-4156
Telephone: (415) 362-3800